

AMENDMENTS IN THE CLAIMS:

*Claims 58, 60-67 and 69-118 are pending in the present application. Claims 72-74, 79 and 87-118 were previously withdrawn from consideration. Claims 1-57, 59, 62, 68, 71 and 80 were previously cancelled. Please amend claims 58, 66, 84 and 85 as follows (this listing of the claims is intended to replace all previous listings of the claims, and shows appropriate status indicators):*

1. -57. (Cancelled)

58. (Currently Amended) A hollow functional element (10) having a longitudinal axis (14), a body section (16), a hollow piercing section (18), an annular contact surface (20) at [[the]] a body part, which extends substantially perpendicular to the longitudinal axis (14) and radially away from the piercing section (18) and an axially extending ring groove (21) which is provided in the body section radially inside the contact surface (20), with the functional element (10) being designed for attachment to a component (22) which is of planar shape at least in the region of the attachment to a sheet metal part, wherein the body section (16) has a pressing surface (24) at the side remote from the piercing section and wherein ribs (26) providing security against rotation are provided which cross the ring groove (21) at least in part and wherein the hollow piercing section has a free end face provided with a circular cutting edge (30) having an edge diameter, wherein a peripheral bead (32) having an apex with an apex diameter is provided at the piercing section (18) between the annular contact surface (20) and the free end face (28) of the piercing section (18), wherein a ring recess (34) is provided around the piercing section axially between the peripheral bead (32) and the free end face (28) of the piercing section and wherein said edge diameter is of the same size as said apex diameter.

59. (Cancelled)

60. (Previously Amended) Functional element in accordance with claim 58, wherein the ring groove (21) runs out via an at least substantially conical surface (36) into the annular contact surface (20).

61. (Previously Amended) Functional element in accordance with claim 58, wherein the peripheral bead (32) has an at least substantially triangular shape when seen in an axial section plane.

62. (Cancelled)

63. (Previously Amended) Functional element in accordance with claim 62, wherein the ring recess (34) is bounded by the peripheral bead (32) at the side remote from the free end face (28) of the piercing section (18).

64. (Previously Amended) Functional element in accordance with claim 58, wherein the ring recess (34) is at least substantially U-shaped when seen in an axial section plane.

65. (Previously Amended) Functional element in accordance with claim 58, wherein the ring recess (34) has at least substantially the shape of a semi-circle when viewed in an axial section plane.

66. (Currently Amended) Functional element in accordance with claim 58, wherein [[it]] the functional element is formed as a hollow fastener element and has a fastener section (13) provided for the reception of a bolt.

67. (Previously Amended) Functional element in accordance with claim 58, wherein the body section (16) has a flange section (40), with the annular contact surface (20) and the axially extending ring groove (21) being provided at or in the flange section (40) at its side facing the piercing section (18).

68. (Cancelled)

69. (Previously Amended) Functional element in accordance with claim 58, wherein the circular cutting edge (30) at the free end of the piercing section (18) forms the transition between a cylinder surface (56) at the outer side of the piercing section (18) and an end face (54) of the piercing section (18).

70. (Previously Amended) Functional element in accordance with claim 69, wherein the cylinder surface (56) is a cylinder surface of a circular cylinder.

71. (Cancelled)

72. (Withdrawn/ Previously Amended) Functional element in accordance with claim 58, wherein the circular cutting edge (30) at the free end face of the piercing section (18) forms the transition between a conical surface tapering in the direction of the flange section at the outer side of the piercing section (18) and said free end face (54).

73. (Withdrawn/ Previously Amended) Functional element in accordance with claim 72, wherein a ring-like discontinuity is located between the conical surface and the U-shaped ring recess (34).

74. (Withdrawn/ Previously Amended) Functional element in accordance with claim 72, wherein the conical surface tapering in the direction of the flange section merges continuously without discontinuity into the U-shaped ring recess (34).

75. (Previously Amended) Functional element in accordance with claim 58, wherein the axial length between the apex (31) of the bead (32) and the free end face (28) of the piercing section (18) lies in the range between 1 and 4 mm.

76. (Previously Amended) Functional element in accordance with claim 58, wherein the axial spacing between the apex (31) of the bead (32) and the annular contact surface (20) which lies in a plane perpendicular to the longitudinal axis (14) lies in the range between 0.2 and 2mm.

77. (Previously Amended) Functional element in accordance with claim 58, wherein the radial depth of the ring recess (34) measured from the apex (31) of the bead (32) lies in the range

between 0.5 and 2 mm.

78. (Previously Amended) Functional element in accordance with claim 69, wherein the axial length of the cylinder surface (56) amounts to 0.3 to 2 mm.

79. (Withdrawn/Previously Amended) Functional element in accordance with claim 72, wherein the axial length of the conical surface amounts to 0.3 to 2 mm.

80. (Cancelled)

81. (Previously Amended) Functional element in accordance with claim 58, wherein the ring groove (21) has a radially extending base surface and said base surface is provided on at least a part of its radial extent with ribs (26) providing security against rotation.

82. (Previously Amended) Functional element in accordance with claim 58, wherein ribs (26) providing security against rotation are provided which extend radially across the peripherally extending ring groove (21).

83. (Previously Amended) Functional element in accordance with claim 82, wherein the ribs (26) providing security against rotation or noses providing security against rotation do not project in the axial direction beyond annular contact surface (20) which lies in a plane perpendicular to the longitudinal axis.

84. (Currently Amended) Functional element in accordance with claim 58, wherein ribs (26) providing security against rotation are provided which extend radially within and across the ring groove (21) and have axially extending sections extending axially from the ring groove up to the peripheral bead (32).

85. (Currently Amended) Functional element in accordance with claim 84, wherein the axially extending sections (26') of the ribs (26) providing security against rotation do not project in

the radial direction beyond the apex (31) of the peripheral bead (32).

86. (Previously Amended) Functional element in accordance with claim 85, in which the axially extending sections (26') of the ribs (26) are set back slightly radially with respect to the apex (31).

87. (Withdrawn) Functional element in accordance with claim 1, wherein the piercing section is formed in the region below the bead (32) in cylindrical manner without ring recess (Fig. 5).

88. (Withdrawn/Previously Amended) Functional element in accordance with claim 1, wherein the peripheral bead (32) has the form of at least one turn of a thread.

89. (Withdrawn) Functional element in accordance with claim 1, wherein the bead (32) has the form of at least two sections (32', 32'') of a turn of a thread.

90. (Withdrawn) Functional element in accordance with claim 1, wherein the bead (32) has the form of sections (32', 32'') of a turn of a left hand thread and of a turn of a right hand thread which are alternately arranged around the longitudinal axis (14).

91. (Withdrawn) Functional element in accordance with claim 30, wherein the turn sections (32', 32'') are connected to one another and preferably form a closed ring.

92. (Withdrawn) Functional element in accordance with claim 34, wherein in total four turn sections (32', 32'') are provided.

93. (Withdrawn) Functional element in accordance with claim 27, wherein the axial sections (26') of the ribs (26) providing security against rotation are of different length.

94. (Withdrawn/ Previously Amended) Component assembly comprising a sheet metal part (22) and at least one functional element (24) with a longitudinal axis (14), with a body section (16), a

hollow piercing section (18), an annular contact surface (20) at the body part, which extends substantially perpendicular to the longitudinal axis (14) and radially away from the piercing section (18) and an axially extending ring groove (21) which is provided in the body section radially inside the contact surface (20), with the functional element being designed for attachment to a component (22) which is of planar shape at least in the region of the attachment, in particular to a sheet metal part, wherein the body section has a pressing surface (24) at the side remote from the piercing section; wherein ribs (26) providing security against rotation are provided which cross the ring groove (21) at least in part; wherein the free end face (28) of the piercing section (18) is provided with a circular cutting edge (30), wherein a peripheral bead (32) is provided at the piercing section (18) between the annular contact surface (20) and the free end face (28) of the piercing section (18); wherein a ring recess (34) is provided around the piercing section between the bead (32) and the free end face (28) of the piercing section (18);

wherein material of the sheet metal part (22) contacts the contact surface (20) and at least substantially fills out the ring groove (21) and wherein the sheet metal part has a piercing in the region of the piercing section through which the piercing section (18) extends, with the bead (32) being received in a ring-like groove (90) in the marginal zone of the piercing.

95. (Withdrawn) Component assembly in accordance with claim 37, wherein the sheet metal part (22) has a ring-like recess (88) around the piercing and at the side remote from the contact surface (20).

96. (Withdrawn) Component assembly in accordance with claim 37, wherein the sheet metal part (22) has a ring-like projection (86) around the piercing and at the side remote from the contact surface (20), with the ring-like projection at least partly surrounding the bead (32) and wherein that a ring-like recess (90) surrounds the ring-like projection (86).

97. (Withdrawn) Component assembly in accordance with claim 38, wherein the ring-like recess (90) in the sheet metal part is surrounded by a planar surface (96) which lies in a plane perpendicular to the longitudinal axis (14) of the fastener element.



98. (Withdrawn/Previously Amended) Component assembly in accordance with claim 40, wherein the body section (16) has a flange section (40) with the annular contact surface (20) and the axially extending ring groove (21) being provided at or in the flange section (40) at its side facing the piercing section (18) and wherein the planar surface (96) lies at least partly opposite to the flange section (40) and to the annular contact surface (20).

99. (Withdrawn/Previously Amended) Component assembly in accordance with claim 37, wherein the ring groove (21) extends radially within the peripheral bead (32) or is bounded at the piercing section side by the peripheral bead (32) and wherein the sheet metal material part also fills out this region of the ring groove (21).

100. (Withdrawn/Previously Amended) Component assembly in accordance with claim 42, wherein, in the region radially within the peripheral bead (32), the ring groove (21) has at least substantially the shape of the semi-circle in an axial section plane.

101. (Withdrawn) Component assembly in accordance with claim 37, wherein the ring bead (32) has an at least substantially triangular shape in an axial section plane and wherein the ring-like groove (90) has the same shape in the marginal zone of the piercing.

102. (Withdrawn) Component assembly in accordance with claim 37, wherein the fastener element is formed as a hollow fastener element (10) and has a fastener section (13) provided for the reception of a bolt, said fastener section (13) being:

- a) located at the side of the flange section (40) remote from the piercing section (18),
- b) located at the side of the flange section (40) remote from the piercing section (18) and extending at least partly into the flange section (40),
- c) located at the side of the flange section (40) remote from the piercing section (18) and extends through the total axial thickness of the flange section (40),
- d) located at the side of the flange section (40) remote from the piercing section (18) and extending through the total axial thickness of the flange section (40) and also through a part of the axial length of the piercing section (18),

e) located at the side of the flange section (40) remote from the piercing section (18) and extending through the total axial thickness of the flange section (40) and also through the total axial length of the piercing section (18),

f) located at the side of the flange section (40) adjacent the piercing section (18) and extending through a part of the axial thickness of the flange section (40) and also through a part of the total axial length of the piercing section (18),

g) located at the side of the flange section (40) remote from the piercing section (18) and extending through a part of the axial thickness of the flange section (40) and also through the total axial length of the piercing section (40),

h) located at the side of the flange section (40) adjacent the piercing section (18) and extending only through the total axial length of the piercing section (18),

i) located at the side of the flange section (40) adjacent the piercing section (18) and extending only through a part of the total axial length of the piercing section (18).

103. (Withdrawn) Component assembly in accordance with claim 1, wherein the ring recess (34), when considered in an axial section plane, has at least substantially the shape of a semicircle and wherein the sheet metal material at least partly fills out the ring recess.

104. (Withdrawn) Component assembly in accordance with claim 37, wherein the ribs (26) providing security against rotation extend in raised manner within the ring groove (21) in the axial direction up to the bead and have an at least substantially rectangular shape with two limbs and wherein the sheet metal material is formed around the two limbs of the ribs providing security against rotation.

105. (Withdrawn) Component assembly in accordance with claim 47, wherein the axially extending sections (26') of the ribs providing security against rotation do not project in the radial direction beyond the apex (31) of the bead (32).

106. (Withdrawn) Component assembly in accordance with claim 48, wherein the axially extending sections (26') of the ribs are arranged set back slightly radially relative to the apex.



107. (Withdrawn/Previously Amended) Component assembly in accordance with claim 37, wherein the axially extending sections (26') of the ribs (26) providing security against rotation do not project in the axial direction beyond the annular contact surface (20) or only fractionally beyond the annular contact surface (20).

108. (Withdrawn/Previously Amended) Component assembly in accordance with claim 37, wherein the peripheral bead (32) has the shape of at least one turn of a thread.

109. (Withdrawn/Previously Amended) Component assembly in accordance with claim 37, wherein the peripheral bead (32) has the shape of at least two sections (32', 32'') of one turn of a thread.

110. (Withdrawn) Component assembly in accordance with claim 37, wherein the bead (32) has the form of sections (32', 32'') of a turn of a left hand thread and of a turn of a right hand thread which are alternately arranged around the longitudinal axis (14).

111. (Withdrawn) Component assembly in accordance with claim 53, wherein the turn sections (32', 32'') are connected to one another and preferably form a closed ring.

112. (Withdrawn) Component assembly in accordance with claim 54, wherein a total of four turn sections (32', 32'') are provided.

113. (Withdrawn) Component assembly in accordance with claim 45, wherein the axial sections (26') of the ribs providing security against rotation are of different length.

114. (Withdrawn/Previously Amended) Method for the manufacture of a component assembly comprising a sheet metal part (22) and at least one functional element (24) with a longitudinal axis (14), with a body section (16), a hollow piercing section (18), an annular contact surface (20) at the body part, which extends substantially perpendicular to the longitudinal axis (14)

and radially away from the piercing section (18) and an axially extending ring groove (21) which is provided in the body section radially inside the contact surface (20), with the functional element being designed for attachment to a component (22) which is of planar shape at least in the region of the attachment, in particular to a sheet metal part, wherein the body section has a pressing surface (24) at the side remote from the piercing section; wherein ribs (26) providing security against rotation are provided which cross the ring groove (21) at least in part; wherein the free end face (28) of the piercing section (18) is provided with a circular cutting edge (30), wherein a peripheral bead (32) is provided at the piercing section (18) between the annular contact surface (20) and the free end face (28) of the piercing section (18); wherein a ring recess (34) is provided around the piercing section between the bead (32) and the free end face (28) of the piercing section (18); wherein material of the sheet metal part (22) contacts the contact surface (20) and at least substantially fills out the ring groove (21) and wherein the sheet metal part has a piercing in the region of the piercing section through which the piercing section (18) extends, with the bead (32) being received in a ring-like groove (90) in the marginal zone of the piercing, the method including the following steps:

a) the sheet metal part (22) is supported on a die button (60) which has a bore (62) having a diameter (D) which is designed to receive the circular cutting edge (30) of the functional element (10), with the bore (62) of the die button (60) being surrounded by a ring projection (64) which merges at the side radially remote from the bore into a surface (66) perpendicular to the longitudinal axis (68) of the bore, with the longitudinal axis (68) of the bore being at least substantially aligned with the longitudinal axis (14) of the functional element,

b) the functional element (10) is moved in the direction towards the sheet metal part (22) and the die button (60) lying beneath it and a piercing slug (80) is removed from the sheet metal part (22) by the circular cutting edge (30), with the piercing slug (80) being received by the bore (62; 63) of the die button or disposed of through it,

c) at the same time as the cutting out of the piercing slug (80) or thereafter, the sheet metal material is shaped by the movement of the body part (16) towards the sheet metal part (22) and the die button (60) by means of the ring projection (64) into the ring groove (21) and around the bead (32) as well as at least partly into the ring recess (34) in order to produce a form-locked connection between the sheet metal part (22) and the functional element (10).

115. (Withdrawn) Method in accordance with claim 57, wherein, on the shaping of the sheet metal material (22) by the ring projection (64), the sheet metal material is also formed around or into the features providing security against rotation, i.e. the ribs (26) providing security against rotation.

116. (Withdrawn) Method in accordance with claim 57, wherein the sheet metal material (22) in the region of the functional element radially outside of a recess caused by the ring projection (62) is pressed flat by the said surface (66) of the die button which stands perpendicular to the longitudinal axis (68).

117. (Withdrawn) Method in accordance with claim 57, wherein the sheet metal material (22) is shaped into a ring collar (86) surrounding the bead (32).

118. (Withdrawn/Previously Amended) Method for the manufacture by cold forming of a functional element (10), in particular of a functional element in accordance with one of the claims 1 to 33, the functional element having a longitudinal axis (14), a body section (16), a hollow piercing section (18), an annular contact surface (20) at the body part, which extends substantially perpendicular to the longitudinal axis (14) and radially away from the piercing section (18) and an axially extending ring groove (21) which is provided in the body section (16) radially inside the contact surface (20), wherein the body section (16) has a pressing surface (24) at the side remote from the piercing section (18) and wherein ribs (26) providing security against rotation are provided which cross the ring groove at least in part and wherein the free end face of the piercing section (18) is provided with a circular cutting edge (30), wherein a peripheral bead (32) is provided at the piercing section (18) between the annular contact surface (20) and the free end face of the piercing section (18) and wherein a ring recess (34) is provided around the piercing section between the bead (32) and the free end face of the piercing section, wherein the method includes the following cold forming steps:

a) an initially cylindrical blank is made in one or more steps into a blank (120) for the functional element (10) with the end face of the cylindrical portion and also the opposite end of the blank each being indented to form respective indents (128; 132) and the body part (18) with the ring groove (21) and a cylindrical section (136), which is later shaped into the piercing section (18), and

also optionally features(26) providing security against rotation being produced in the region of the ring groove (21) and/or at the cylindrical section (136),

b) material adjacent to the end face of the cylindrical section is shifted in the direction towards the ring-like groove (21) to form the peripheral bead (32) while reducing the outer diameter of the cylindrical section (136) in the region of its end face, wherein, on the formation of the bead (32) in the form of a turn of a thread or of a plurality of sections (32'; 32'') of a thread, the ribs (26; 26'') providing security against rotation are also shaped at their free ends,

c) in a further step, the end face of the functional element (10) is deformed and enlarged in diameter in order to form the cutting edge (30) at the end face of the cylindrical section and a ring groove (34) around the cylindrical section between the end face of the cylindrical section and the bead,

d) the thus finished manufactured blank is subsequently pierced or is simultaneously pierced by means of a hole punch in the region between the two indents (130, 132) and, if desired, the pierced region is subsequently provided with a thread.